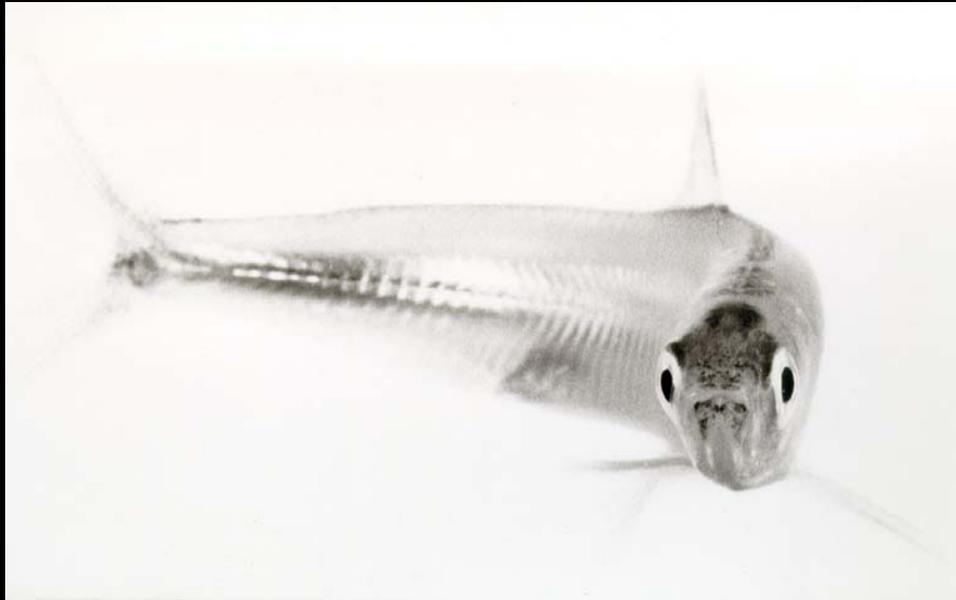


POD Update



Chuck Armor

Interagency Ecological Program

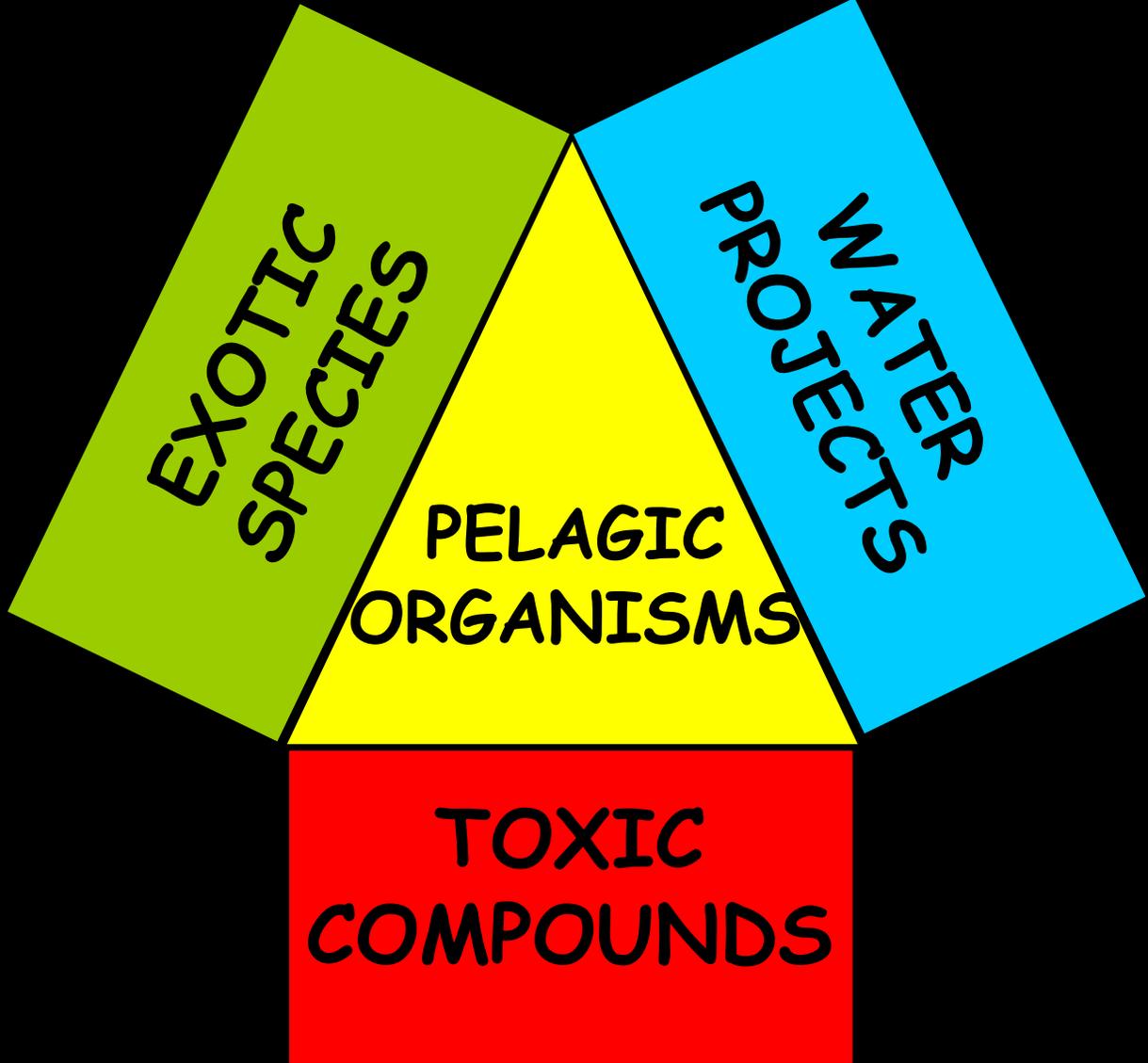
Pelagic Organism Decline ("POD") Management Team

- **DFG**
 - Chuck Armor, Randy Baxter, Marty Gingras
- **DWR**
 - Matt Nobriga, Rich Breuer, Anke Mueller-Solger, Ted Sommer
- **CBDA**
 - Steve Culberson
- **USBR**
 - Mike Chotkowski
- **USEPA**
 - Bruce Herbold
- **NMFS**
 - Jeff McLain

POD Principal Investigators

- Dept Fish and Game
 - Randy Baxter, Marade Bryant, Kelly Souza, Steve Slater, Lee Mecum, Russ Gartz, Kathy Hieb, Marty Gingras
- Dept Water Resources
 - Matt Nobriga, Fred Feyrer, Ted Sommer, Bob Suits, Marc Vaysierres, Heather Peterson, Zoltan Matica, Peggy Lehman, Lenny Grimaldo
- US Bureau of Reclamation
 - Mike Chotkowski
- USEPA
 - Bruce Herbold
- US Geological Survey
 - Joe Simi, Cathy Ruhl
- UC Davis
 - Bill Bennett, Swee Teh, Inge Werner, Dave Ostrach
- SF State University
 - Wim Kimmerer
- SF Estuary Institute
 - Daniel Oros, Geoff Siemering, Jennifer Hayworth
- Consultant
 - Bryan Manly

FACTORS IN THE PELAGIC ORGANISM DECLINE 2005 RESULTS

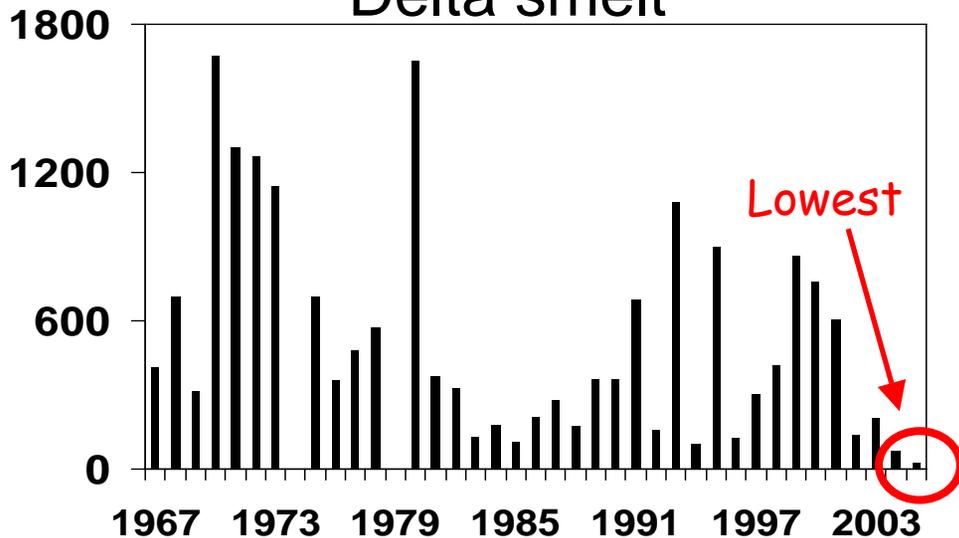


2005 Abundance Results

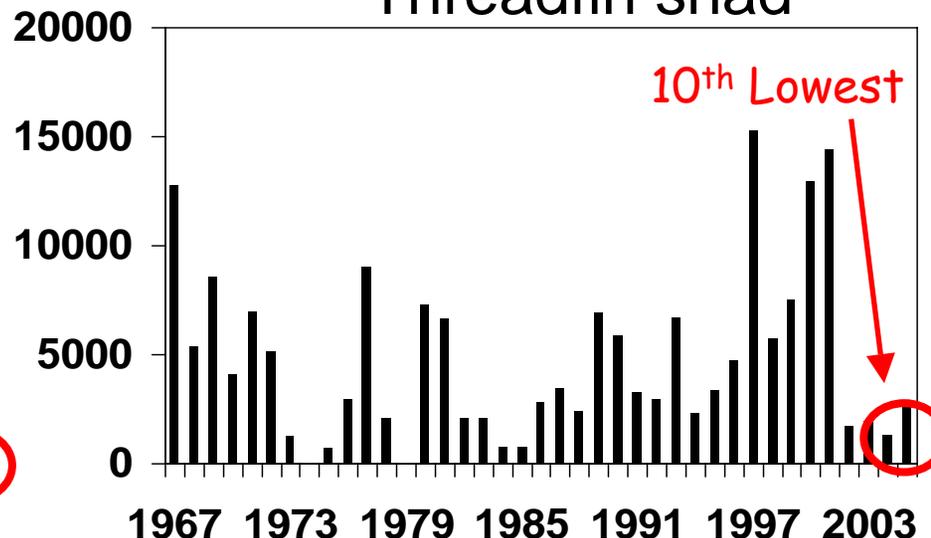
- ➔ Hypothesis: Improved Hydrology in 2005 would have no major effect on the decline.

2005 Fall Abundance Indices

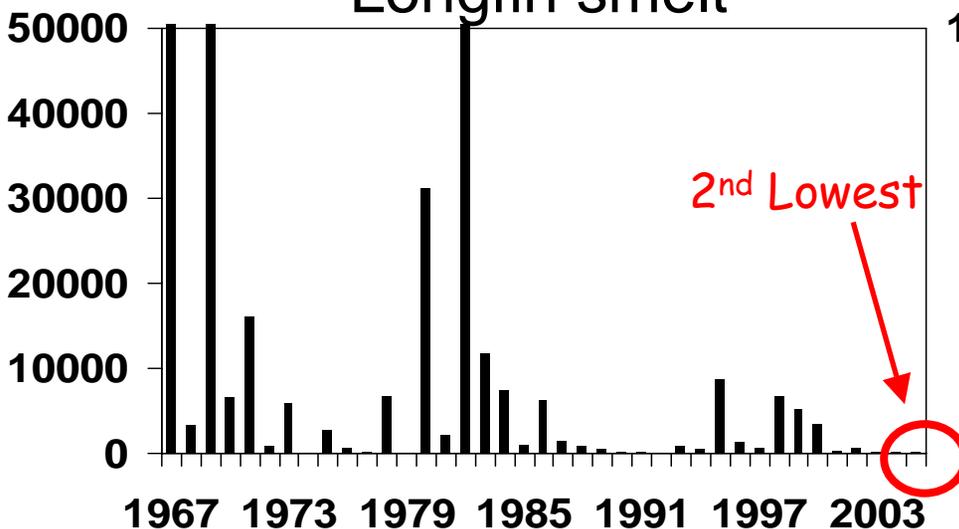
Delta smelt



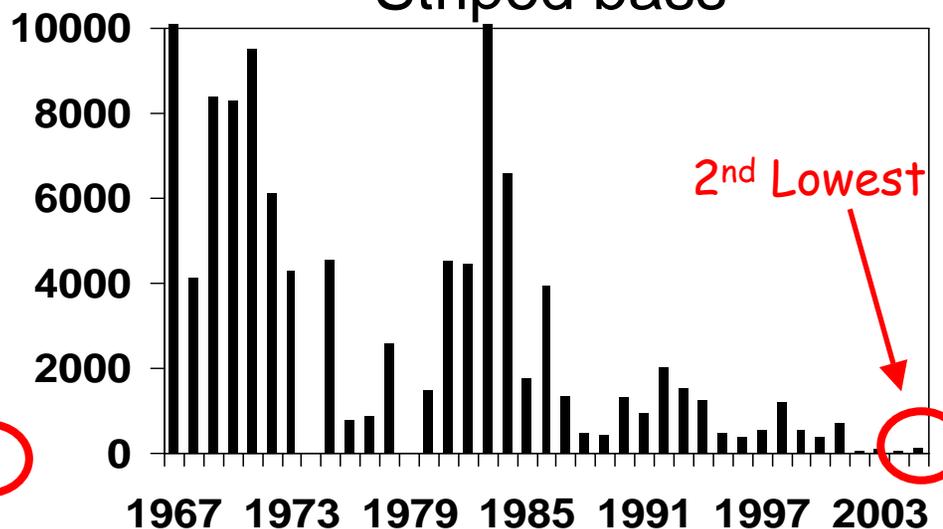
Threadfin shad



Longfin smelt



Striped bass



FACTORS IN THE PELAGIC ORGANISM DECLINE

2005 RESULTS



Water Project Operations: Initial Summary

Recent Hydrology and Operations

Less San Joaquin River flow

Shift in timing of exports

Longer duration of barrier operations

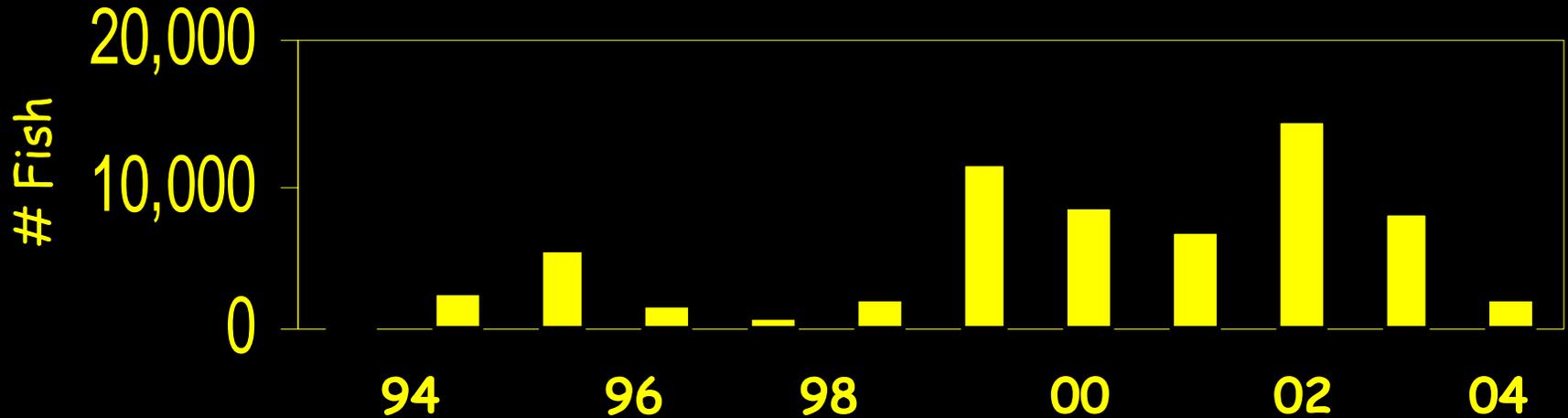


Effects?

Trends in Fish Salvage



Winter Salvage of Delta Smelt



Recent higher levels at State and Federal Water Projects

The Winter Salvage Hypothesis

Recent Hydrology and Operations

Less SJR River flow

Shift in timing of exports



Entrainment

Increase in winter salvage.

FACTORS IN THE PELAGIC ORGANISM DECLINE 2005 RESULTS



"Bad Suisun Bay" Hypothesis

Recent Trends

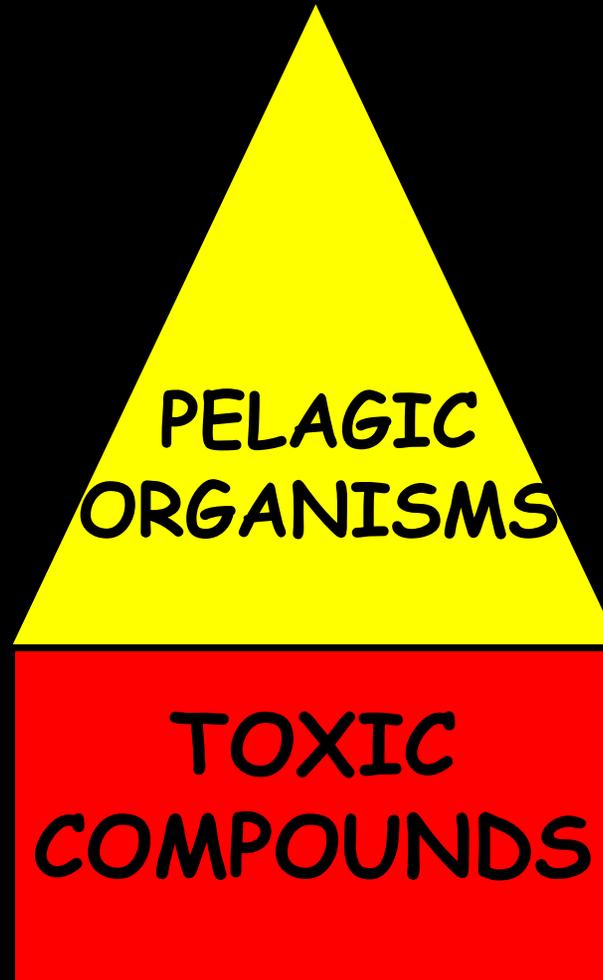
Expansion in the range of the clam
Corbula

Food web
disruption

Consistent with BJ
Miller Analyses

Decline in zooplankton
(calanoid copepods) in
Suisun Bay

FACTORS IN THE PELAGIC ORGANISM DECLINE 2005 RESULTS

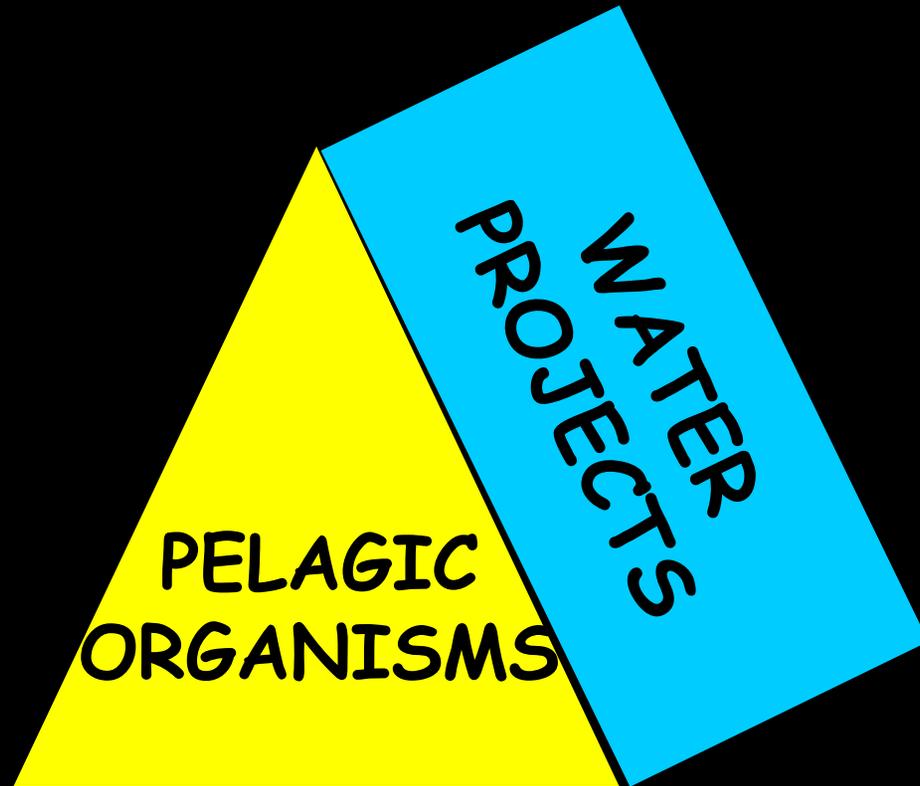


Toxic Effects: 2005 Study Highlights

-  Changes in the patterns of use for herbicides and pesticides, but it is unclear if these changes pose serious risks.
-  Significant toxicity in some bioassays for 40% of sampling sites; however, the cause was not identified.
-  Toxic blue-green alga (*Microcystis*) was present throughout the Delta at substantially higher levels in 2005 than 2004

FACTORS IN THE PELAGIC ORGANISM DECLINE

May 2006 Update



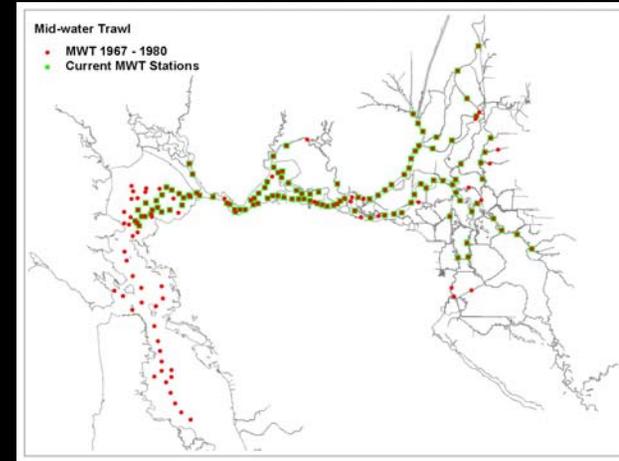
What factors were correlated with the step changes in abundance?

Bryan Manly and Mike Chotkowski

- Analyses of fall fish trawl data.
- Gross hydrology (inflow - exports) has a statistically significant but minor effect on the step changes in abundance.

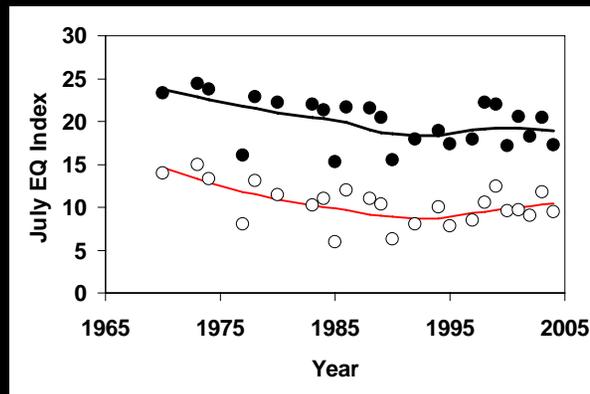
Trends in Fish Habitat

Model of fish habitat "needs" using water quality data



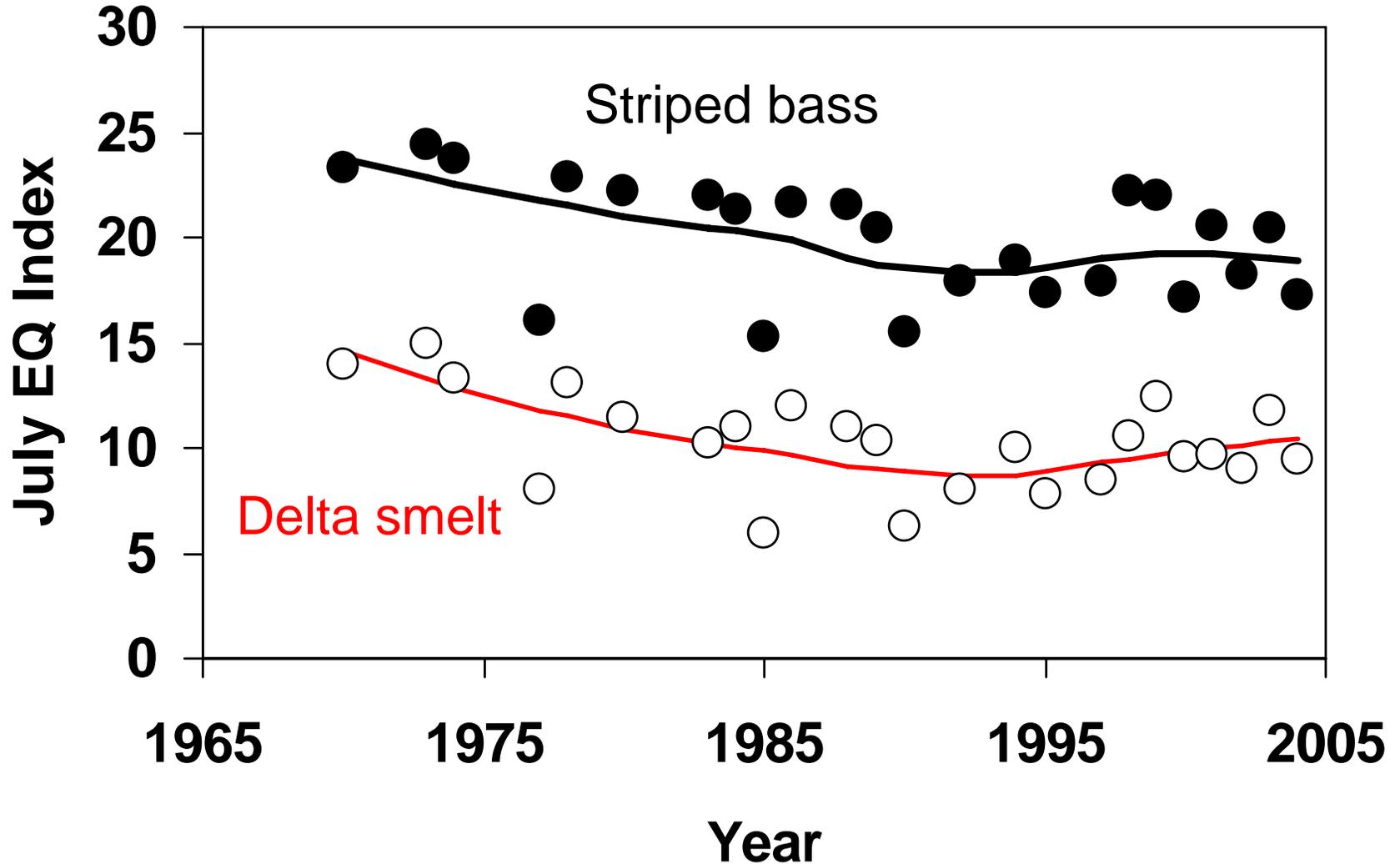
Combine information

Long-term water quality data for estuary

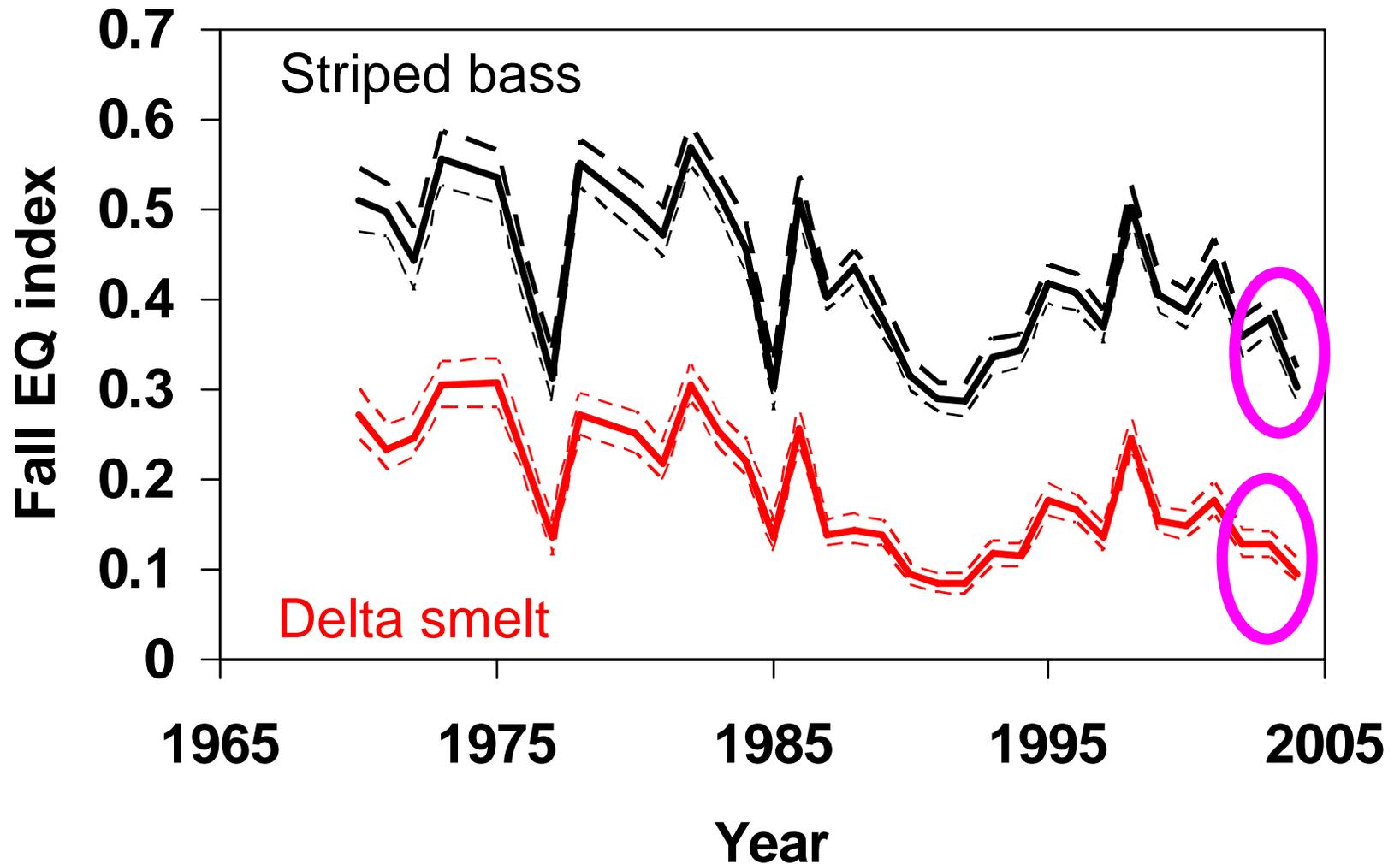


Trends in Environmental Quality (EQ)

Summer “habitat quality” has deteriorated



Fall “habitat quality” has deteriorated too



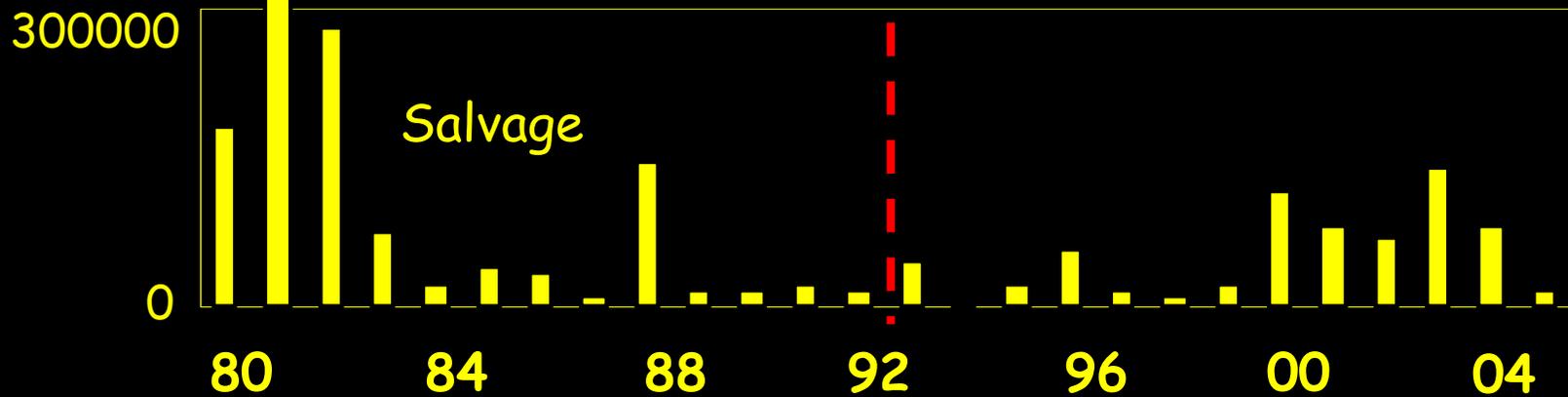
Consistent with Contra Costa Water District analyses

Has there been a recent decrease in Delta residence time?

- Longer residence time is important for food web species
- Trends evaluated by DWR using a particle tracking model.
- No evidence of recent changes for Sacramento or San Joaquin rivers.



Winter Salvage of Delta Smelt (Nov-Mar)

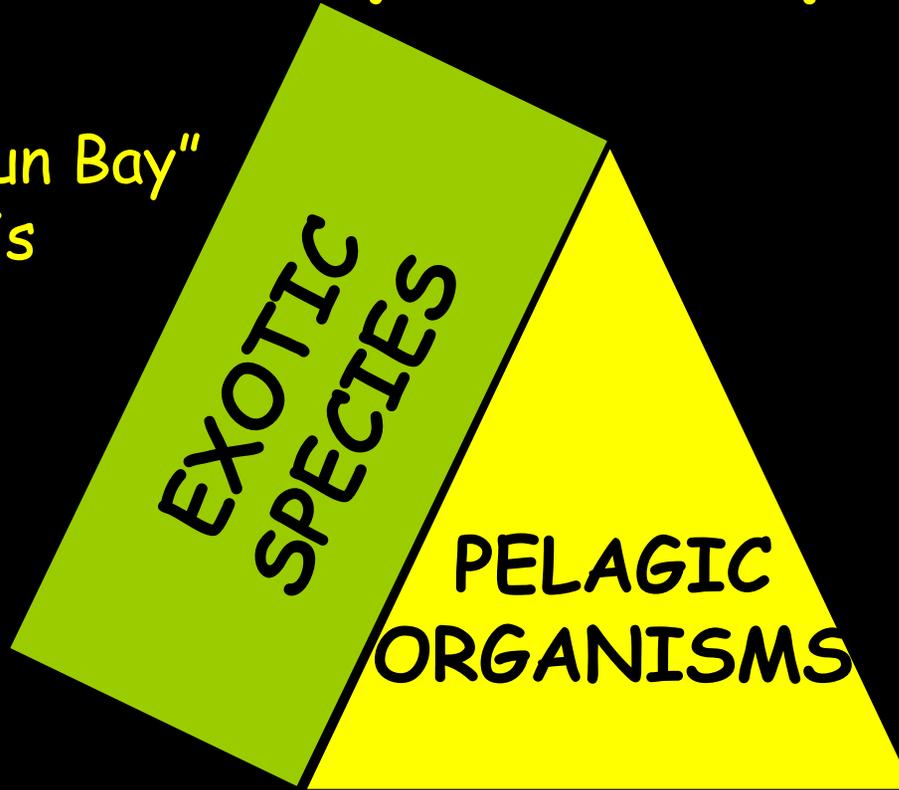


Recent high salvage levels are not unique

FACTORS IN THE PELAGIC ORGANISM DECLINE

May 2006 Update

"Bad Suisun Bay"
Hypothesis



Changes in the Suisun Bay Food Web

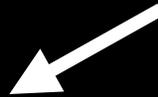
Hypothesis by
Wim Kimmerer
(SFSU)



Detritus &
Bacteria



Ciliates



Small copepods

Large
copepods



Clams
(*Corbula*)



Phytoplankton

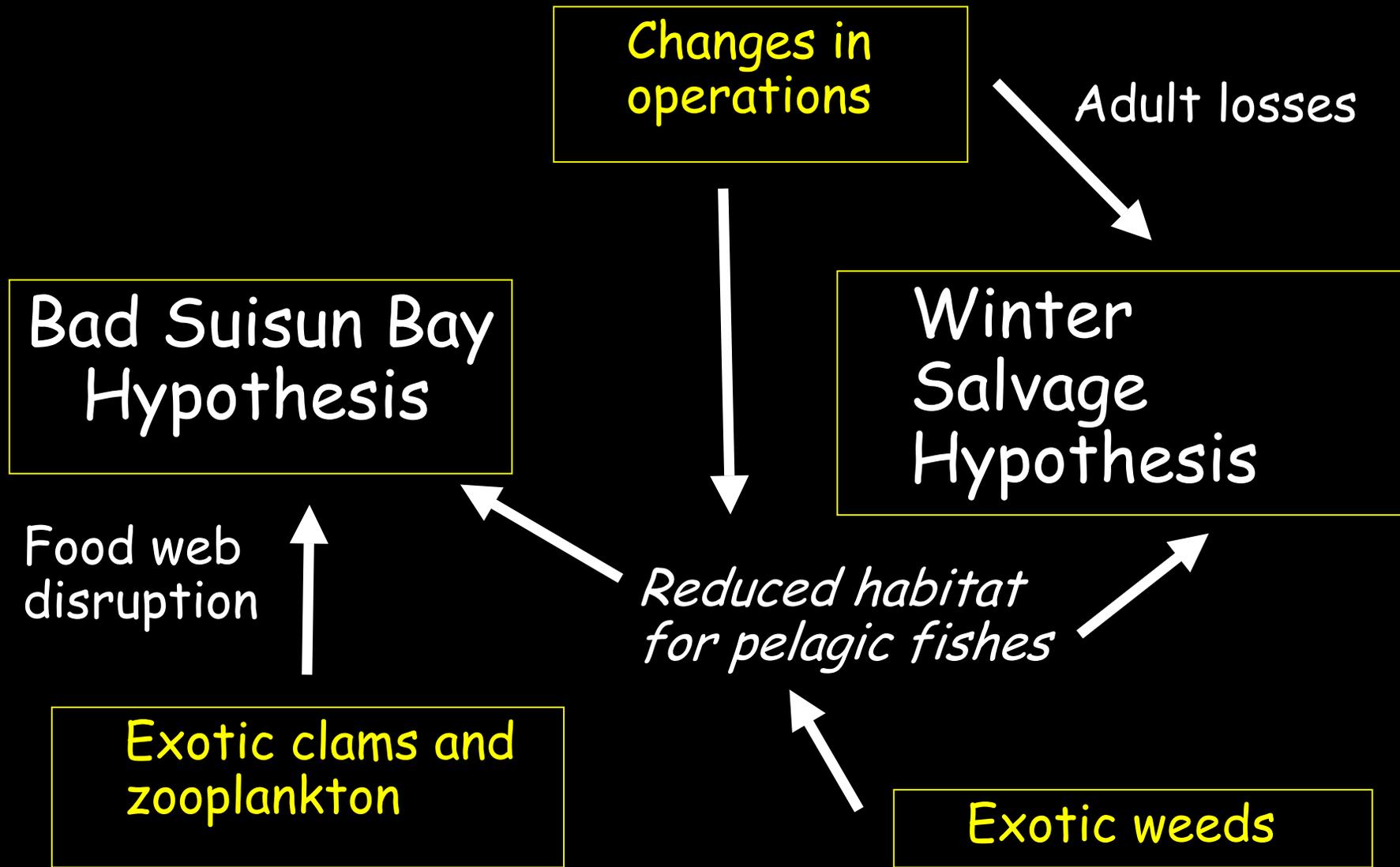


Recent

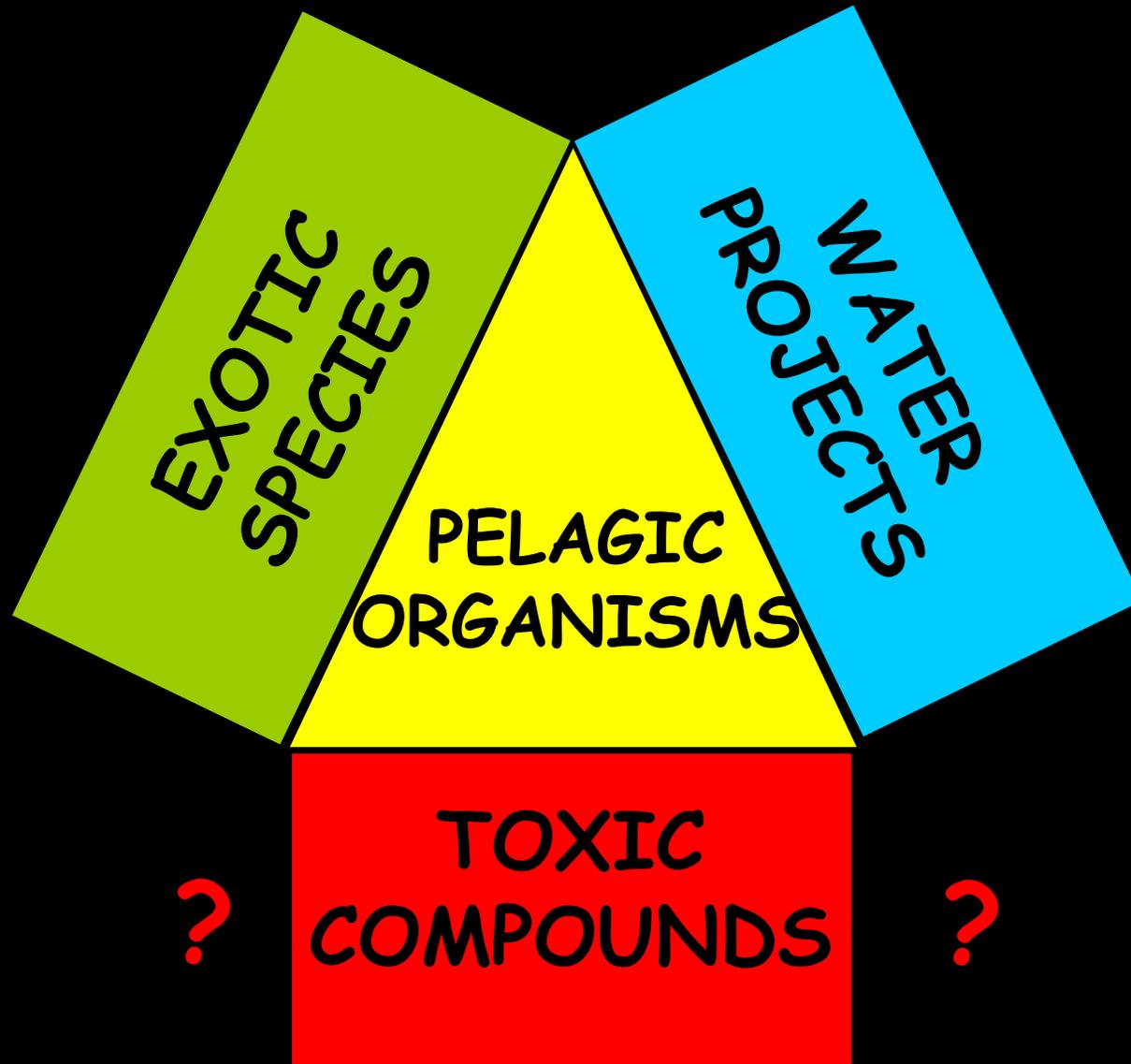
1980s

1970s

New Linkages Between Hypotheses?



FACTORS IN THE PELAGIC ORGANISM DECLINE



2006-2007 Studies CONTAMINANTS

Is the water toxic?
Bioassays on water samples
(UCD)



What is the cause of the toxicity?
Toxicity evaluation - TIE (UCD)



*What are the sources and
population level effects of
toxicity?*

2006-2007 Studies: Sources and Effects of Toxicity

*Do wild fish show
toxicity problems?*

Histopathology &
biomarker analysis (UCD)

*Role of toxic algae?
Microcystis studies
(DWR/UCD)*

Contaminant sources?

Regional monitoring
data & modeling
(SFEI et al.)

*Population level
effects?*

Dose response modeling
(UCD)

Additional Highlights of 2006-2007 Work Plan



Narratives

- *Bad Suisun Bay*
- *Winter Salvage*
- Other hypotheses and linkages



Food web effects

- Phytoplankton (UCD)
- Zooplankton (SFSU, BJ Miller)
- Benthos (DWR, SFSU)



Fish diseases (USFWS, UCD)



Power plant effects (Mirant, IEP, SWC)



Modeling

- Abundance vs. environmental conditions (Manly, USBR, DWR, CCWD)
- Fish population models (SFSU, UCD)
- Particle tracking (DWR)



Ongoing syntheses (IEP, outside groups)

